

POTENTIAL OF A NITROGEN TETROXIDE SPILL OR EMISSION
DURING MOVEMENT FROM SUPPLIER TO USER

Wilbur F. Watje
Chemist
Quality Division
Directorate of Energy Management
Kelly Air Force Base TX

Conference on Environmental
Engineering for Nitrogen Tetroxide
Florida Institute of Technology
Melbourne, Florida
March 30 and 31, 1978

POTENTIAL OF A NITROGEN TETROXIDE SPILL OR EMISSION DURING MOVEMENT FROM SUPPLIER TO USER

INTRODUCTION

As an introduction, (Slide 1), I would like to describe how the Directorate of Energy Management (SF) is involved in nitrogen tetroxide support. SF has the responsibility to supply all DOD and NASA facilities with nitrogen tetroxide. We provide the many services - inventory management, quality control, procurement, transportation, and packaging - to insure that the user receives specification material. SF controls all of the transportation of nitrogen tetroxide between the supplier and DOD or NASA users. There are many potential problems and hazards in shipping nitrogen tetroxide - a Class A poison gas, oxidizer and a very corrosive material if it becomes wet.

TRANSPORT EQUIPMENT

First, let's outline the type of equipment used to transport nitrogen tetroxide. (Slide 2) The Code of Federal Regulations Title 49 and exemption to Title 49 specifies the type of equipment that can be used. Nitrogen tetroxide is moved in carbon steel tank cars, tank trailers and ton containers. This transport equipment is in dedicated service for nitrogen tetroxide. (Slide 3) Our average annual movement of the oxidizer is 1.7 million pounds of N_2O_4 (NT0), 1 million pounds of N_2O_4 (MON-I) and .4 million pounds of N_2O_4 (MON-III).

SHIPPING

(Slide 3A) Nitrogen tetroxide is moved directly from the supplier to the various using locations. Specific routing instructions are provided to each carrier for each shipment of N_2O_4 . When alternate routes are available, trailers are routed around towns. The DOT exemption 1321 provides special requirements for the drivers on parking and safety.

POTENTIAL FOR SPILLS

(Slide 4) During the handling and movement of N_2O_4 , there are potential areas for leaks, emissions or spills. These areas include:

- a. Accidental spills. Accidental spills can result from vehicle accidents, corrosion, poor housekeeping and human errors.
- b. Transfer operations. The greatest potential for spills or leaks is during coupling or uncoupling of the hoses for loading or unloading of tankers.
- c. Sampling. Each shipping container requires sampling before it leaves the plant after loading. This can present problems with disposal of the purged liquid and the residual sample.
- d. "Empties" - The so-called "empty" trailer is a potential source of emission. Some people tend to forget that the empty trailer contains residual material and they do not handle the vessel as carefully as a full vessel.

(Slide 5) We have been moving nitrogen tetroxide since 1961. Each year we move about 3.1 million pounds of nitrogen tetroxide and the transport equipment logs about 250,000 round trip miles each year. Since

we have been moving N_2O_4 , the personnel in the Directorate can remember of four incidents involving N_2O_4 trailer while in transit. Only two of the four incidents resulted in the release of N_2O_4 vapors to the environment. There have been no reported incidents of leakage involving tank cars or one ton containers while in transit. There have been problems with leaks at the QD's while unloading at Vandenberg. Occasionally, railcars being used for storage developed gas leaks in the dome area.

(Slide 6) Some of the corrective actions taken to reduce the reoccurrence of the above problems have been:

- a. Route trailers around town when possible.
- b. Specific load sizes below the maximum loads.
- c. Replacing the dome plates with stainless steel and installing new piping and valves.
- d. Request contractor to improve their maintenance, testing and housekeeping of the QD's and trailers.
- e. Provide check lists for tank car and trailer inspections prior to loading and after unloading.
- f. Establish maximum pressure on trailers.

Our accident rate for movement of nitrogen tetroxide by trailer is 1.3 accident per million miles or one per four years.

CONCLUSION

In conclusion, there are many areas that are potential sources of an accidental release of N_2O_4 to the environment. We have taken positive actions to reduce our accident rate and improve our service.

POTENTIAL OF A NITROGEN TETROXIDE SPILL OR
EMISSION DURING MOVEMENT FROM SUPPLIER TO USER.

TRANSPORT UNITS

	<u>DOT SPEC</u>	<u>METAL</u>	<u>PRESSURE RATING</u>
TANK CARS	105A500W	CARBON STEEL AND LAGGED WITH 4 INCH CORK	500
TRAILERS	MC330 NOVEL	CARBON STEEL	300
TON CONTAINERS	106A500X	CARBON STEEL	500

TRANSPORT UNITS (CONT)

	<u>SAFETY</u>	<u>TANK RETEST</u>	<u>CAPACITY</u>
TANK CARS	SAFETY VALVE EQUIPPED WITH FRANGIBLE DISC	10 YEARS SAFETY 5 YEARS	110,000 LBS
TRAILERS	SAFETY VALVE EQUIPPED WITH FRANGIBLE DISC	30 MONTHS	40,000/ 30,000 LBS
TON CONTAINERS	SHALL NOT BE LIQUID FULL AT 130 DEGREES F	5 YEARS	2,000 LBS

SLIDE 2 (CONT)

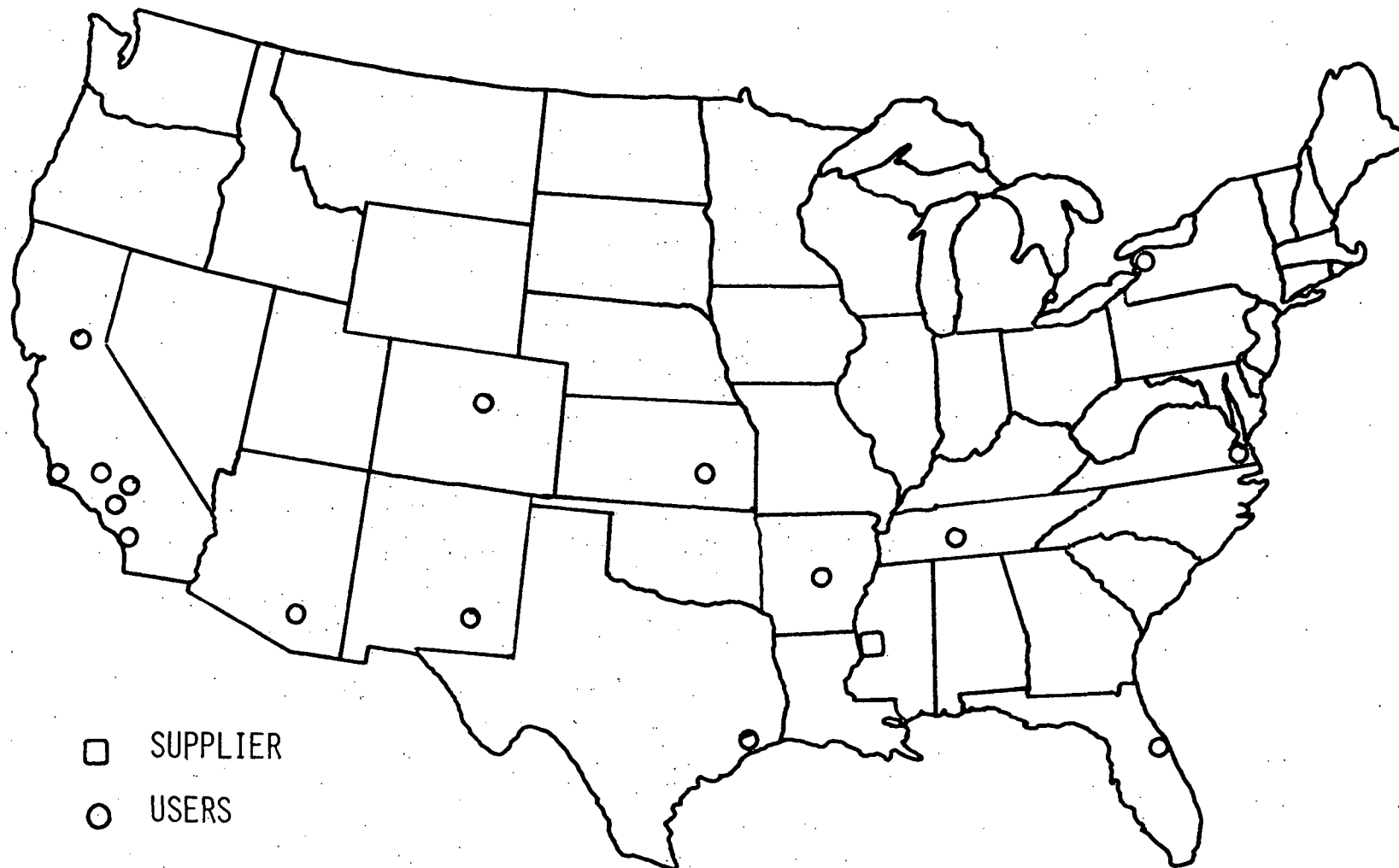
ANNUAL MOVEMENT

NT0 1.7 MILLION LBS

MON-I 1 MILLION LBS

MON-III .4 MILLION LBS

LOCATIONS OF NITROGEN TETROXIDE FACILITIES



□ SUPPLIER
○ USERS

POTENTIAL AREAS

ACCIDENT

LOADING/UNLOADING

SAMPLING

EMPTY TRAILERS

HISTORY

1961

- 3.1 MILLION LBS OF N_2O_4
- 250,000 MILES PER YEAR
- TRAILERS
- TANK CARS

CORRECTIVE ACTION

ROUTES

LOAD SIZE

UPDATING TRAILER DOMES AREA

CHECK LIST